NORTH DAKOTA
SURFACE WATER QUALITY MANAGEMENT PROGRAM
ANNUAL REPORT - FEDERAL FISCAL YEAR 2020

Introduction

This report is intended to comply with the end-of-year reporting requirements for the Watershed Management Program's (WMP's) responsibilities under the State/EPA Performance Partnership Agreement and Grant. Under the Clean Water Act (CWA) Section 106, the WMP is responsible for lake, reservoir, river, stream and wetland monitoring in the state and for the assessment and reporting of its surface waters under Sections 305(b) and 303(d). Of importance, in May 2019, the North Dakota Department of Environmental Quality (NDDEQ) became a cabinet agency within the state of North Dakota. Prior to that date, we were affiliated with the North Dakota Department of Health's (NDDoH) Environmental Health Section (EHS).

Goals, Objectives and Performance Measures

Environmental Goal 1

The WMP has three goals: one environmental goal and two programmatic goals. The environmental goal of the WMP is to maintain safe and clean water. Related to this goal the WMP has established an objective to restore and improve water quality on a watershed basis using the watershed approach. Performance measures SP-10, SP-11 and SP-12 are related to this objective and are tracked through biennial water quality assessment and reporting requirements provided in Section 305(b) and Section 303(d) of the CWA. Performance measure SP-10 is described as attainment of water quality standards for all pollutants and impairments in waterbodies identified in 2002 as not attaining water quality standards, while SP-11 is described as the removal of specific causes of waterbody impairments identified in 2002. The Department identified eighteen (18) waterbodies as meeting measure SP-10 and 139 causes as meeting SP-11 through September 2018.

Performance measure SP-12 is described as improvement in water quality conditions at the watershed scale (i.e., 12-digit hydrologic unit). Improvement, in this case, means that one or more of the waterbody impairment causes identified in 2002 are removed for at least 40% of the impaired waterbodies, stream miles, or lake acres in the sub-watershed. Improvement can also be described as significant watershed-wide improvement, as demonstrated by valid scientific information, in one or more water quality parameters or indicators related to the impairment. The Department has set an SP-12 goal of eight (8) sub-watersheds by September 2020. To date, the Department has submitted eight (8) reports documenting SP-12 watershed improvements. These include Pipestem Creek, Lake LaMoure/Cottonwood Creek, Powers Lake, Bear Creek, the lower Wild Rice River, Antelope Creek and most recently Thirty-Mile Creek and Shortfoot Creek which were submitted in 2017 as Option 2b-water quality improving SP-12's.

Programmatic Goal 1

The first programmatic goal of the WMP is to improve surface water quality monitoring and assessment programs. Consistent with EPA's guidance document entitled Elements of a State Monitoring and Assessment Program (March 2003), the Department completed its final comprehensive monitoring strategy and received approval on October 15, 2009. This strategy establishes a water quality monitoring goal ***to develop and implement monitoring and assessment programs that will provide representative data of sufficient spatial coverage and of known precision and accuracy that will permit the assessment, restoration and protection of the quality of all the state's waters.*** In support of this goal and the water quality goals of the state and of the CWA, the Department has established 10 monitoring and assessment objectives. They are:

1. Provide data to establish, review and revise water quality standards;
2. Assess water quality status and trends;
3. Determine beneficial use support status;
4. Identify impaired waters;
5. Identify causes and sources of water quality impairments;
6. Provide support for the implementation of new water management programs and for the modification of existing programs;
7. Identify and characterize existing and emerging problems;
8. Evaluate program effectiveness;
9. Respond to complaints and emergencies; and
10. Identify and characterize reference conditions.

In addition to addressing water quality monitoring for the state's streams, rivers, lakes and reservoirs, the strategy outlines a comprehensive plan to monitor and assess the state's wetland resource. The approach integrates Level I, II and III assessment methodologies as well as a probabilistic sampling design.

As part of its implementation of the state monitoring strategy, the North Dakota Water Quality Monitoring Council (Council) was formed in 2009. The Council, which is currently made up of over 25 state and federal agencies, academic institution and private organizations, has as its mission statement "to promote and facilitate collaboration for effective collection, analysis, and sharing of water quality data." To that end the Council has established a web site ([HYPERLINK "http://www.ndwatermonit.org/"]).

The planning phase for the 5th ND Water Quality Monitoring Council (Council) has concluded. The North Dakota Water Quality Monitoring Conference was planned to be held in Bismarck, ND on March 24 – 26, 2020. This 3-day conference attracts water resource professionals and students from Montana, Minnesota, Colorado, North and South Dakota and Manitoba and features presentations on a wide variety of subjects pertaining to water quality monitoring. Unfortunately, due to the ongoing Covid-19 pandemic, the in-person meeting is postponed until further notice.

Completion of the "2018 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads" (2018 Integrated Report)

was approved by EPA in May 2019. The WMP has transitioned to the new ATTAINS Web Express system for entering and storing assessment information. Assessments for the 2018 Integrated Report have been completed. Due to program transition and staff turnover, it's anticipated that a joint 2020/2022 Integrated Report will be completed and submitted to EPA by April 2022.

National Aquatic Resource Surveys and Related State Intensification Projects

National Rivers and Streams Assessment and State Intensification Project

In 2013 and 2014, the Department completed sampling as part of the National Rivers and Streams Assessment (NRSA) and state intensification project. As is the case with the National Lakes Assessment and the National Wetland Condition Assessment, the NRSA uses a random sample site design to provide estimates of the ecological condition and aquatic life use of the nation's rivers and streams and to identify key stressors affecting impaired waters.

The NRSA sample design included 40 "base" probability sites, three (3) of which are "non-wadable" sites located on the Red River which were sampled by the state of Minnesota. The remaining 37 NRSA "base" probability sites located on North Dakota waters included 31 "wadable" sites and six (6) "non-wadable" sites. The NRSA sample design also included four (4) repeat sites, two (2) "wadable" and two (2) "non-wadable" site visits in North Dakota for a total of 41 NRSA site visits. Of this total, the eight (8) "non-wadable" site visits (six "base" sites and two repeat sites) were sampled by an EPA contractor. The remaining 33 "wadable" site visits (31 "base" sites and two repeat sites) were sampled by the Department. The Department also conducted an intensification of the NRSA in North Dakota which included an additional 10 sites. In 2013 the Department conducted sampling at 21 sites (19 base site visits and two repeats) and in 2014 the Department sampled the remaining 22 sites.

All samples collected for the NRSA and state intensification project have been analyzed by EPA contract labs and have been entered into the Department's database(s). Based on data collected during the 2013/2014 NRSA, Department staff will prepare a detailed report summarizing the condition of rivers and streams in North Dakota with known precision and accuracy. Once this report is complete, the statewide condition estimates will then be entered into the ATTAINS web entry tool for State-scale Statistical Surveys.

The Department concluded it's participation in the 2018/2019 NRSA. The sample design for the 2018/2019 NRSA includes 46 "base" probability sites. Of these, 37 are wadable river and stream sites that will be sampled by the Department and nine (9) "non-wadable" sites that will be sampled by an EPA contractor. The Department is also conducting an intensification of the NRSA in North Dakota which includes an additional four (4) sites. In 2018 the Department conducted sampling at 22 sites (19 base site visits and three repeats). In 2019 the Department conducted sampling at 18 sites. Originally, the Department planned to conduct sampling on 20 sites but, due to wet conditions and high-water levels, two sites had to be completed by contractors as sampling methods switched from wadeable to boatable.

The Department also participated in the 2008/2009 NRSA. The NRSA design for 2008 and 2009

involved 61 randomly selected sites in North Dakota. The population of rivers and streams from which these sites were selected include both wadable and non-wadable perennial rivers and streams located throughout the state. A report summarizing the results of the 2008/2009 NRSA and state intensification project has been completed. Results from this report, including the statewide condition estimates, were entered into the ATTAINS web entry tool for State-scale Statistical Surveys. Results from the state intensification were also summarized and included in the 2018 Integrated Report.

Ambient Water Quality Monitoring Program for Rivers and Streams

In 2012, the USGS North Dakota Water Science Center completed an analysis of the state's ambient water quality monitoring network, including the North Dakota Department of Environmental Quality's (NDDEQ) fixed station ambient monitoring network and the ND State Water Commission's (SWC's) High/Low flow network. In addition to evaluating trends, providing loading estimates and providing a spatial comparison of sites, the report, entitled "Evaluation of Water-Quality Characteristics and Sampling Design for Streams in North Dakota, 1970-2008" ([HYPERLINK "http://pubs.usgs.gov/sir/2012/5216/"]), provided recommendations for a revised water quality monitoring network for rivers and streams in the state. These recommendations were made to ensure adequate coverage, both spatially and temporally, which is necessary to estimate trends, estimate loads and provide for general water quality characterization in rivers and streams across the state.

Beginning on January 1, 2013 and based on the recommendations provided in the USGS report, the NDDEQ, in cooperation with the USGS and the SWC, implemented a revised ambient water quality monitoring network for rivers and streams. This revised ambient water quality monitoring network consists of a set of core monitoring sites representing three (3) levels of sampling intensification. The highest level of sites, design level 1, consist of a network of 32 basin integrator sites (Table 1). These sites are sampled eight (8) times per year, twice in April, once each in May, June, July, August, and October, and one time in the winter (January) under ice. The next level, design level 2, consists of 25 sites (Table 2). These sites are sampled six (6) times per year, once each in April, May, June, August and October and once under ice during the winter (January). The lowest level of sites, design level 3, consists of 25 sites located across the state (Table 3). These sites are sampled four (4) times per year, once each in April, June, August and October. Under the current design, the USGS samples all of the design level two (2) sites (with the exception of the Red River at Harwood which is sampled by the Department) and all the design level 3 sites.

At all level 1, 2 and 3 sites field measurements are taken for temperature, dissolved oxygen, pH and specific conductance. Sampling and analysis at all level 1, 2 and 3 sites consist of general chemistry, dissolved trace elements, and total and dissolved nutrients. In addition to these water quality parameters, total organic carbon (TOC), dissolved organic carbon (DOC), total suspended solids (TSS), and E. coli bacteria are sampled and analyzed for at all level 1 sites. E. coli bacteria are only to be sampled during the recreation season (May-September). In addition to sampling for these analytes, the Red River at Fargo, the Red River at Grand Forks, and the Red River at Pembina are sampled for total suspended sediment. The analysis of the total suspended sediment samples is conducted by the USGS Iowa Sediment Laboratory. All

chemical analysis of samples is performed by the Department's Laboratory Services Division.

Through a cooperative agreement with the USGS, a "real-time water quality monitoring" station was added to the Red River at Fargo (USGS site 05054000; NDDEQ site 385414) and Red River at Grand Forks (USGS site 05082500; NDDEQ site 384156) sites in September 2003 and May 2007, respectively. Real-time monitoring at these sites includes a continuous recording YSI Model 600 multi-probe sonde and datalogger that monitors field parameters (e.g., temperature, specific conductance, pH, dissolved oxygen and turbidity) continuously. Output from the sonde is transmitted via telemetry and the data posted "real-time" on the USGS North Dakota Water Science Center web site. As this data set has increased, regression relationships have been developed for select water quality variables (e.g., TSS, TDS, total phosphorus and total nitrogen) using the continuously recorded field parameters. These regression relationships have now been used to provide "real-time" concentration estimates of TSS, total phosphorus, total nitrogen and TDS that are posted on the USGS Dakota Water Science Center web site ([HYPERLINK "https://www.usgs.gov/centers/dakota-water"]).

In FY2016, the network was enhanced further when the water quality monitoring sites located on the Little Muddy River near Williston, ND and the White Earth River near White Earth, ND were upgraded from level 3 to level 2 sites and continuous recording temperature and specific conductance was added to the Little Muddy River near Williston, ND site. These two sites continue to be sampled by the USGS North Dakota Water Science Center with an additional two samples per year. The USGS also installed and operates the real-time temperature and specific conductance monitor at the Little Muddy River location.

Table 1. Level 1 Ambient River and Stream Water Quality Monitoring Sites.

USGS Site ID	NDDoH Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
05051300	385055	Bois de Sioux River near Doran, MN	46.1522	-96.5789	1	NDDEQ
05051510	380083	Red River at Brushville, MN	46.3695	-96.6568	1	NDDEQ
05053000	380031	Wild Rice River near Abercrombie, ND	46.4680	-96.7837	1	NDDEQ
05054000	385414	Red River at Fargo, ND[1]	46.8611	-96.7837	1	USGS-GF
05057000	380009	Sheyenne River near Cooperstown, ND	47.4328	-98.0276	1	NDDEQ
05058000	380153	Sheyenne River below Baldhill Dam, ND	47.0339	-98.0837	1	NDDEQ
05058700	385168	Sheyenne River at Lisbon, ND	46.4469	-97.6793	1	NDDEQ
05059000	385001	Sheyenne River near Kindred, ND	46.6316	-97.0006	1	NDDEQ
05060100	384155	Maple River below Mapleton, ND	46.9052	-97.0526	1	NDDEQ
05066500	380156	Goose River at Hillsboro, ND	47.4094	-97.0612	1	USGS-GF
05082500	384156	Red River at Grand Forks, ND[1]	47.9275	-97.0281	1	USGS-GF
05083000	380037	Turtle River at Manvel, ND	48.0786	-97.1845	1	USGS-GF
05085000	380039	Forest River at Minto, ND	48.2858	-97.3681	1	USGS-GF
05090000	380157	Park River at Grafton, ND	48.4247	-97.4120	1	USGS-GF
05100000	380158	Pembina River at Neche, ND	48.9897	-97.5570	1	USGS-GF
05102490	384157	Red River at Pembina, ND	48.9769	-97.2376	1	USGS-GF
05114000	380091	Souris River nr Sherwood	48.9900	-101.9582	1	USGS-Bis

Table 1 (con't). Level 1 Ambient River and Stream Water Quality Monitoring Sites.

USGS Site ID	NDDoH Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
05117500	380161	Souris River above Minot, ND	48.2458	-101.3713	1	USGS-Bis
05120000	380095	Souris River nr Verendrye, ND	48.1597	-100.7296	1	USGS-Bis
05124000	380090	Souris River nr Westhope, ND	48.9964	-100.9585	1	Environment Canada
06336000	380022	Little Missouri River at Medora, ND	46.9195	-103.5282	1	NDDEQ
06337000	380059	Little Missouri River nr Watford City, ND	47.5958	-103.2630	1	NDDEQ
06339500	384131	Knife River nr Golden Valley, ND	47.1545	-102.0599	1	NDDEQ
06340500	380087	Knife River at Hazen, ND	47.2853	-101.6221	1	NDDEQ
06345500	380160	Heart River nr Richardton, ND	46.7456	-102.3083	1	NDDEQ
06349000	380151	Heart River nr Mandan, ND	46.8339	-100.9746	1	NDDEQ
06351200	380105	Cannonball River nr Raleigh, ND	46.1269	-101.3332	1	NDDEQ
06353000	380077	Cedar Creek nr Raleigh, ND	46.0917	-101.3337	1	NDDEQ
06354000	380067	Cannonball River at Breien, ND	46.3761	-100.9344	1	NDDEQ
06468170	384130	James River nr Grace City, ND	47.5581	-98.8629	1	NDDEQ
06470000	380013	James River at Jamestown, ND	46.8897	-98.6817	1	NDDEQ
06470500	380012	James River at Lamoure, ND	46.3555	-98.3045	1	NDDEQ

[1]USGS Real-time water quality monitoring station.

Table 2. Level 2 Ambient River and Stream Water Quality Monitoring Sites.

USGS Site ID	NDDoH Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
05051522	NA	Red River at Hickson, ND	46.6597	-96.7959	2	USGS-GF
05051600	385573	Wild Rice River near Rutland, ND	46.0222	-97.5115	2	USGS-GF
05054200	385040	Red River at Harwood, ND	46.9770	-96.8203	2	NDDEQ
05055300	385505	Sheyenne R above DL Outlet nr Flora, ND	47.9078	-99.4162	2	SWC
05056000	385345	Sheyenne River near Warwick, ND	47.8056	-98.7162	2	USGS-GF
05057200	384126	Baldhill Creek near Dazey, ND	47.2292	-98.1248	2	USGS-GF
05059700	385351	Maple River near Enderlin, ND	46.6216	-97.5740	2	USGS-GF
05064500	NA	Red River at Halstad, MN	47.3519	-96.8437	2	USGS-GF
05065500	NA	Goose River nr Portland, ND	47.5389	-97.4556	2	USGS-GF
05082625	385370	Turtle River at State Park near Arvilla, ND	47.9319	-97.5145	2	USGS-GF
05084000	NA	Forest River near Fordville, ND	48.1972	-97.7306	2	USGS-GF
05092000	380004	Red River at Drayton, ND	48.5722	-97.1476	2	USGS-GF
05116500	380021	Des Lacs River at Foxholm, ND	48.3706	-101.5702	2	USGS-Bis
05123400	384132	Willow Creek nr Willow City, ND	48.5889	-100.4421	2	USGS-Bis
05123510	384133	Deep River nr Upham, ND	48.5842	-100.8626	2	USGS-Bis
06331000	380054	L Muddy River blw Cow Cr nr Williston, ND	48.2845	-103.5730	2	USGS-Bis
06332000	NA	White Earth River at White Earth, ND	48.3756	-102.7672	2	USGS-Bis
06335500	385031	Little Missouri River at Marmath, ND	46.2978	-103.9175	2	USGS-Bis
06340000	380060	Spring Creek at Zap, ND	47.2861	-101.9257	2	USGS-Bis

Table 2 (con't). Level 2 Ambient River and Stream Water Quality Monitoring Sites.

USGS Site ID	NDDoH Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
06342500	380028	Missouri River at USGS-Bismarck, ND	46.8142	-100.8214	2	USGS-Bis
06349500	385053	Apple Creek nr Menoken, ND	46.7944	-100.6573	2	USGS-Bis
06350000	380025	Cannonball River at Regent, ND	46.4267	-102.5518	2	USGS-Bis
06352000	384182	Cedar Creek nr Haynes, ND	46.1542	-102.4740	2	USGS-Bis
06354580	384056	Beaver Creek blw Linton, ND	46.2686	-100.2518	2	USGS-Bis
06469400	380152	Pipestem Creek nr Pingree, ND	47.1675	-98.9690	2	USGS-Bis

Table 3. Level 3 Ambient River and Stream Water Quality Monitoring Sites.

USGS Site ID	NDDoH Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
05052500	385232	Antelope Creek at Dwight, ND	46.3113	-96.7345	3	USGS-GF
05054500	380135	Sheyenne River above Harvey, ND	47.7028	-99.9490	3	USGS-Bis
05056060	385089	Mauvais Coulee Trib #3 nr Cando, ND	48.4575	-99.2243	3	USGS-GF
05056100	380207	Mauvais Coulee nr Cando	48.4481	-99.1026	3	USGS-GF
05056200	385092	Edmore Coulee nr Edmore	48.3367	-98.6604	3	USGS-GF
05056215	385093	Edmore Coulee Trib nr Webster	48.2664	-98.6809	3	USGS-GF
05056239	385091	Starkweather Coulee nr Webster, ND	48.3206	-98.9407	3	USGS-GF
05056340	380213	Little Coulee nr Leeds, ND	48.2433	-99.3729	3	USGS-GF
05060500	385302	Rush River at Amenia, ND	47.0166	-97.2143	3	USGS-GF
05099400	385287	Little South Pembina near Walhalla, ND	48.8653	-98.0059	3	USGS-GF
05101000	381279	Tongue River at Akra, ND	48.7783	-97.7468	3	USGS-GF
05113600	384135	Long Creek nr Noonan, ND	48.9811	-103.0766	3	USGS-Bis
05120500	384107	Wintering River nr Karlsruhe, ND	48.1383	-100.5399	3	USGS-Bis
06332515	NA	Bear Den Creek nr Mandaree, ND	47.7872	-102.7685	3	USGS-Bis
06332523	NA	East Fork Shell Creek nr Parshall, ND	47.9486	-102.2149	3	USGS-Bis
06332770	NA	Deepwater Creek at Mouth nr Raub, ND	47.7378	-102.1077	3	USGS-Bis
06336600	385030	Beaver Creek nr Trotters, ND	47.1631	-103.9927	3	USGS-Bis
06339100	385054	Knife River at Manning, ND	47.2361	-102.7699	3	USGS-Bis
06342260	380103	Square Butte Creek below Center, ND	47.0569	-101.1935	3	USGS-Bis
06343000	NA	Heart River nr South Heart, ND	46.8656	-102.9485	3	USGS-Bis
06344600	NA	Green River nr New Hradec, ND	47.0278	-103.0532	3	USGS-Bis
06347000	385582	Antelope Creek nr Carson	46.5453	-101.6454	3	USGS-Bis
06347500	385078	Big Muddy Creek nr Almont, ND	46.6944	-101.4674	3	USGS-Bis
06348500	NA	Sweetbriar Creek nr Judson, ND	46.8517	-101.2532	3	USGS-Bis
06470800	384215	Bear Creek nr Oakes, ND	46.2252	-98.0718	3	USGS-Bis

Lake Water Quality Assessment Program

In 2020 lake water quality monitoring was conducted on Lake Sakakawea and Devils Lake, the state's two largest lakes. The Department conducts water quality monitoring on Devils Lake four times each year. The Department has also maintained an active water quality monitoring program on Lake Sakakawea. Working cooperatively with the North Dakota Game and Fish

Department (NDGF) and the US Army Corps of Engineers, the Department conducted dissolved oxygen/temperature profile monitoring on Lake Sakakawea monthly from July through October in 2020. Primary sampling activities on Lake Sakakawea have been coordinated by the US Army Corps of Engineers as the Department has staff limitations at this point.

In 2020, the Department also conducted Lake Water Quality Assessment Program (LWQAP) sampling at 19 small to mid-sized lakes and reservoirs in the state (Table 4). In 2020, the Department focused on lakes and reservoirs in the southeast part of the state. Lakes and reservoirs with little or no water quality data or lakes which have not been sampled in the last 10-15 years were given priority.

Lakes and reservoirs were sampled one time each during May, July, and September. Temperature, conductivity, pH and dissolved oxygen profiles were recorded for each lake, as well as Secchi disk transparency during each sampling trip. Further, lakes were analyzed for surface concentrations of total and dissolved nutrients, major cations and anions, trace elements, and chlorophyll-α. Results from the 2020 LWQAP will be summarized in a report for each lake and posted on the Department's website, when available.

Table 4. 2020 Lake Water Quality Assessment Program (LWQAP) Lakes.

Lake Name	County	Red Basin	STORET Station
Alkali Lake[7,8]	Sargent	Upper	381360
Antelope Lake[2,3,8]	Pierce	Upper	386033, 386034
Balta Dam[7,8]	Pierce	Upper	380975
Brewer Lake[4,5,6,7,8]	Cass	Upper	381010
Buffalo Lake[3,6,7,8]	Pierce	Upper	381205
Carlson-Tande Dam[6,7,8]	Griggs	Upper	385507
Dead Colt Creek Dam[4,5,7]	Ransom	Upper	380340
Fordville Dam[3,4,5,7,8]	Grand Forks	Lower	381240
Golden Lake (North)[7,8]	Steele	Upper	381340
Golden Lake (South)[4,7,8]	Steele	Upper	380531
Lake Upsilon[2,7]	Rolette	Lower	380641
Larimore Dam[2,4,5,7,8]	Grand Forks	Lower	381250
Moon Lake[7,8]	Barnes	Upper	380825
Mooreton Pond[6,7]	Richland	Upper	385207
Mount Carmel Dam[2,4,7,8]	Cavalier	Lower	381080
Red Willow Lake[2,4,7,8]	Griggs	Upper	380500
Silver Lake[7,8]	Sargent	Upper	381100
Sprague Lake[7,8]	Sargent	Upper	381110
Stump Lake[1,3,8]	Nelson	Upper	380930, 380931

Reference Site Monitoring Project

In 2020, the Reference Site Monitoring Project focused on the Lake Agassiz Plain (48) ecoregion of North Dakota. The Department has developed a state "Nutrient Criteria Development Strategy", which forms the blueprint for the development of nutrient criteria for the state's rivers, streams, lakes, reservoirs and wetlands. This strategy describes a "reference" condition approach for the development of nutrient criteria for the state's rivers and streams. This approach is also a key component of the state's biological monitoring and assessment program. The purpose of this task is to continue to establish and maintain a core set of reference sites throughout the state that can be used to support nutrient criteria development and the ongoing refinement of biological indicators used in the state's bioassessment program. This project will continue to expand/refine the current set of "reference" and "impaired" sites in each level III ecoregion in the state. Previous reference site monitoring activities took place in 2005 – 2007 for the Red River Bioassessment Project, then again in 2010 and 2015. In 2020, 15 additional and/or existing "reference" and "impaired" sites (30 total) will be selected and sampled for fish and macroinvertebrates in the Lake Agassiz Plain ecoregion. Additional sampling in 2020 will refine the current list of reference sites to include the highest quality locations. Biological indicators and nutrient criteria will be tested by comparing the results from the "impaired" sites to the "reference" sites. Water chemistry variables, including nutrients, will also be sampled. The original workplan included visiting 30 sampling locations, however, due to excess precipitation and high-water levels in the Red River basin, only 20 sampling locations were able to be visited.

STORET/WQX

The Department enters all of its water quality results in the WMP's Sample Identification Database (SID). From there, data are entered into EPA's STORET Data Warehouse through the Water Quality Exchange (WQX). The WQX is a framework that makes it easier for States to submit and share water quality monitoring data over the Internet. WQX uses Extensible Markup Language (XML) and a defined set of data elements (the WQX schema) to allow states to submit data from their own database to the STORET Warehouse. Data that follow the WQX schema can be submitted via WQX using the North Dakota Exchange Network Node. The data are submitted directly to the publicly-accessible STORET Data Warehouse using the WQX framework and the internet. The Division of Water Quality's WMP is in production mode for all water quality data exchanges at this time. Data exchanges are currently submitted manually and are done on a weekly basis.

Surface Water Quality Data Retrieval Web Portal

To allow easier access to the Department's surface water quality data, a web-based tool was developed that provides easy public access to surface water quality data for streams, rivers and lakes across the state of ND. The web based tool provides a map of North Dakota to help locate and identify water quality monitoring stations, allows users to view and download summary statistic and time series plots of data, and allows the user to view and download the raw data in a comma delimited (.csv) file format. To further help the user search for specific data types, there are options to filter by an individual water chemistry analyte, by field measurements, lake

profiles, or by entire analyte group. The site can be accessed by going to the following web address: [HYPERLINK "file:///\\\\nd.gov\\doh\\DOHM-ENG\\WATER\\SURFACE\\19_ProgramTransition\\PPA%20WORKPLAN\\FY2018-2019%20PPA\\2019PPASurfaceWaterEOY20191125.docx"]. Currently, the Surface Water Quality Data Retrieval Web Portal is in the midst of a significant update in order to increase data retrieval efficiency.

Supplemental Section 106 Water Quality Monitoring Projects

Beginning in FY 2005, EPA has made available a supplemental Clean Water Act (CWA) Section 106 annual appropriation for enhanced water quality monitoring programs, projects and activities identified in the state Water Quality Monitoring Strategy. In addition to providing additional funding to enhance existing state monitoring programs, these supplemental Section 106 grants have also been used to establish a nationwide statistical survey program in an effort to begin answering broader water quality questions. The following is a summary of projects funded and implemented in FY2019.

River Keepers Volunteer Monitoring Program

River Keepers is a nonprofit organization that advocates for the sustainable use of the Red River of the North. As part of its mission, River Keepers has been monitoring the water quality of the Red River in the Fargo-Moorhead area since 2000. River Keepers began monitoring the Red River and one of its tributaries, the Wild Rice River, with an Environmental Monitoring for Public Access and Community Tracking (EMPACT) grant from the Environmental Protection Agency in 2000. Following the EMPACT grant, River Keepers maintained a monitoring program on the Red and Wild Rice Rivers with support from a variety of sources, including the Buffalo-Red River Watershed District and the Southeast Cass Water Resource District, City of Fargo, North Dakota Department of Health and the Minnesota Pollution Control Agency. With funding provided through the FY2019 Section 106 Supplemental Monitoring Initiative grant, River Keepers collected water quality samples two times per month during ice out conditions (April-November) at three sites on the Red River and one site on the Wild Rice River in 2020. Samples were analyzed for major cations and anions, trace elements, nutrients, TSS and E. coli bacteria (May-September). In addition, field measurements were taken for temperature, pH, conductivity and dissolved oxygen.

US Geological Survey QWTrend Analysis for the Red River Basin

Trend analysis of water-quality conditions in the Red River Basin has been completed by various agencies for various time periods, locations and constituents, but an integrated watershed approach for assessing water quality trends with current data has not been completed. QWTrend is a robust parametric time series model developed by the US Geological Survey (USGS) which uses maximum likelihood estimation to compute flow-normalized concentrations. The trend analysis which will be completed by this project will focus on trends in flow-normalized concentrations, which are the trends in concentrations that would have been observed if flow conditions were uniform from year-to-year and thus represent changes unrelated to natural hydroclimatic variability. Streamflow in the Basin has been extremely high compared to

previous decades, therefore the trend analysis using QWTrend, will provide a much-needed understanding of concentration changes while accounting for changes in streamflow.

The QWTrend analysis is a cooperative project with primary funding coming from an IJC International Watersheds Initiative (IWI) grant. In addition to the $100,000 provided through the IWI grant and the $20,000 provided through supplement 106 funding, the Minnesota Pollution Control Agency (MPCA) is providing $20,000, Manitoba Sustainable Development is providing $10,000 in in-kind services and the USGS is providing $30,000 in cooperative funding.

To date, available data from each agency and jurisdictions have been compiled by the USGS and reviewed for consistency and suitability for the analysis. A two-day QWTrend training was also provided to state and provincial agencies represented in the three jurisdictions (North Dakota, Minnesota and Manitoba) at the end of August in Detroit Lakes, MN. Other project deliverables include: 1) a presentation on the project at relevant conferences during course of the project (e.g., Annual Red River Basin Land & Water International Summit Conference); 2) a peer-reviewed USGS Scientific Investigations Report will be prepared describing the dataset, models, and results and will be available online; 3) an interactive story map hosted on IJC's online map service; and 4) an executive summary style write-up for IJC with a "Lessons Learned" write-up. The project is scheduled for completion by February 2020. This project resulted in a USGS publication titled 'Time-Series Model, Statistical Methods, and Software Documentation for R-QWTREND – An R Package for Analyzing Trends in Stream-Water Quality', 2020.

Programmatic Goal 2

The second programmatic goal described in the WMP's FY2020/2021 PPA Workplan is to restore the chemical, physical and biological integrity of North Dakota's lakes, reservoirs, rivers, streams and wetlands so that water quality standards and beneficial uses are protected and maintained. The Department is committed to meeting this goal through the development of TMDLs, by conducting water quality and watershed assessments and through the implementation of Section 319 NPS watershed projects.

The Department's Section 303(d) TMDL program is the primary tool for accomplishing this objective. Section 303(d) requires the state to assess the status of its rivers, streams, lakes, reservoirs and wetlands and to provide a list of waters which are water quality limited (i.e., not meeting water quality standards) and are in need of TMDLs. In fulfillment of this reporting requirement, the state completed the "North Dakota 2018 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads" (2018 Integrated Report). The WMP has transitioned to the new ATTAINS Web Express system for entering and storing assessment information.

Identifying and listing impaired waters needing TMDLs is the first step in the process of reducing the number of rivers and lakes which are impaired. The draft 2018 TMDL list is represented by 225 assessment units (AUs) and 340 individual waterbody/pollutant combinations. For purposes of TMDL development, each waterbody/pollutant combination requires a TMDL. Final AU and waterbody/pollutant counts are available in the final 2018 Integrated Report and through ATTAINS.

The responsibility for TMDL development in North Dakota lies primarily with the Department's Division of Water Quality WMP. TMDL development staff are located in one regional field office in Towner, ND, and in the main office located in Bismarck, ND. Technical support for TMDL development projects and overall program coordination is provided by WMP staff that are also located in Bismarck, ND. Additional support is provided by EPA Region 8 staff in Denver, CO.

Beginning in FY 2014 and continuing in FY 2016 and FY 2018 the Department began the process of developing a plan to implement the new EPA TMDL Long-Term Vision as described in the final document entitled "A Long-Term Vision for Assessment, Restoration, and Protection Under the Clean Water Act Section 303(d) Program." This "Vision" includes six (6) main goals. They are: 1) prioritization; 2) assessment; 3) protection; 4) alternatives (i.e., alternative approaches to TMDLs); 5) engagement; and 6) integration.

To accomplish the TMDL Program's prioritization goal of systematically prioritizing and reporting on priority watersheds or waters for restoration and protection and to facilitate State strategic planning to achieve water quality protection and improvement, the WMP has developed a "North Dakota Total Maximum Daily Load Prioritization Strategy." This TMDL Prioritization Strategy describes a two-phased approach for prioritizing impaired waters for TMDL development and watershed planning. Specifically, the TMDL prioritization strategy will be used to identify 1) a list of priority waters targeted for TMDL development or alternative approaches in the next two years (near term); and 2) a list of priority waters scheduled for likely TMDL development or alternative restoration approaches through 2022 (long term). For purposes of TMDL listing, both near term (next two years) and long term (through 2022) TMDL waterbodies are considered "high" priority for TMDL development or alternative restoration approaches.

This list of priority waterbodies and associated pollutants forms the basis for TMDL Program measure reporting (i.e., WQ-27). For purposes of WQ-27, the Department submitted, and EPA approved, 61 waterbodies (66 waterbody/pollutant combinations) for TMDL and alternative plan development by 2022. From this list, referred to as the WQ-27 universe, the Department completed 5 TMDLs in FY2016, 4 TMDLs in 2017, 5 TMDLs in 2018 and 1 TMDL in 2019 and public comments were received for 1 TMDL in 2020. Currently, the Department is working with local stakeholders for additional feedback prior to finalizing the 2020 document. Additionally, 2 alternative plans are near completion. Recent transitions and staff turnover within the WMP, as well as transitions at EPA, have resulted in a temporary lapse in TMDL productivity. However, the Department is committed to meeting the WQ-27 objectives as originally planned. In addition, EPA accepted two alternative restoration plans that were completed in 2017 and two more alternative restoration plans that were completed in 2018. The Department has identified 23 potential waterbody/pollutant combinations for TMDL and alternative restoration plan development through 2022.